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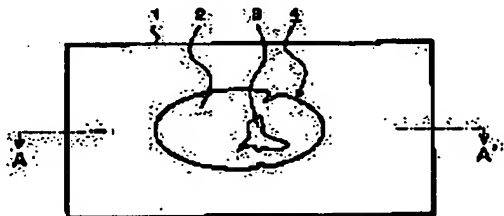
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## (54) POLYESTER FILM FOR LAMINATE

## (57)Abstract:

PROBLEM TO BE SOLVED: To obtain the subject film which has excellent abrasion resistance, excellent moldability and excellent taste characteristic and is suitable for laminating to a substrate, by forming a plurality of uneven portions each having one or more projected portions at the adjacent points in one or more sunk portions on the surface of the film and specifying a melting point.

SOLUTION: This film for a laminate has the following characteristics. A plurality of uneven portions each having one or more projected portions in one or more sunk portions and/or a plurality of uneven portions each having one or more projected portions at one or more points adjacent to one or more sunk portions are formed on at least one surface of the film, and the film has a melting point of 246 to 270°C. The area fraction of the sunk portions is preferably  $1 \times 10^{-3}$  to  $5 \times 10^{-1}$ , and the breaking strengths of the film in the longitudinal direction and the width direction of the film are preferably  $\geq 120$  MPa, respectively, at 150°C. For example, a biaxially oriented film 1 has a plurality of sunk portions



4 each comprising a sunk portion 2, a projected portion 3, a sunk portion 2 and a projected portion 3.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

**[Field of the Invention]** This invention relates to the polyester film for a lamination. In detail, even if it performs fabrication after a lamination, adhesion is good, the fabrication to containers, such as a metal can, is [ a lamination with base materials, such as a metal plate, is easy, ] easy, and it excels in a taste property, and is further related with the polyester film for a lamination and the lamination which is excellent in \*\*\*\*\*-proof at the time of fabrication.

**[0002]**

**[Description of the Prior Art]** Industrial ingredients, such as base films and electrical insulation materials, such as a magnetic-recording ingredient, and covering material, and since biaxial-stretching polyester film has the outstanding thermal resistance, a mechanical characteristic, and an electrical property, and it excels in printing nature and vacuum evaporation nature further, it is widely used also for wrapping.

**[0003]** In recent years, the application of biaxial-stretching polyester film is diversified increasingly, and laminates with direct heat through a base material and adhesives, and the application used by giving shaping etc. has been developed.

**[0004]** For example, conventionally, the can inside and external surface of a metal can applied the thing which made the solvent dissolve or distribute various thermosetting resin, such as an epoxy system and a phenol system, for the purpose of corrosion prevention, and covering a surface of metal was performed widely. However, desiccation of a coating and ink takes long duration to covering of such thermosetting resin, and presswork, productivity falls or they have problems which are not desirable, such as environmental pollution by a lot of organic solvents.

**[0005]** As an approach of solving these problems, there is the approach of making dissolve a direct front face to the metal plate which performed various kinds of surface treatment, such as plating, to the steel plate which is the ingredient of a metal can instead of, an aluminum plate, or this metal plate, and laminating a film through adhesives, in it. [ covering of thermosetting resin ] And when manufacturing a metal can using the metal plate which laminated the film, the following properties are required of a film.

- (1) Excel in the lamination nature to a metal plate, and adhesion.
- (2) a moldability -- excelling -- the time of shaping -- a film -- a crack and a pinhole -- and -- it can delete -- etc. -- a defect should not arise.
- (3) When an impact joins the metal can after shaping, a crack and a pinhole should not occur on a film.
- (4) A film is not adsorbed in the taste of the contents of a can, and a sense-of-smell component, or the flavor of contents is not spoiled with the effluent from a film (it is hereafter indicated as a taste property).

**[0006]** The polyester film which many proposals are made in order to solve these demands, for example, has a specific coefficient of static friction in JP,8-239492,A is indicated. Moreover, it is torn by JP,9-87397,A with specific surface roughness, and is indicated about the projection. Furthermore, the film

which is beyond the value of specification [ coefficient of friction in 80 degrees C ] is indicated by JP,10-44319,A. However, these proposals were difficult to be compatible in the taste property in the application as which \*\*\*\*\*-proof which cannot necessarily satisfy the above various demand characteristics synthetically, and was especially excellent, and a moldability are required.

[0007]

[Problem(s) to be Solved by the Invention] The purpose of this invention is to cancel the trouble of the above-mentioned conventional technique, is excellent in \*\*\*\*\*-proof, a moldability, and a taste property, and is to offer the suitable polyester film for a lamination to laminate and use for a base material.

[0008]

[Means for Solving the Problem] Two or more concave heights which have a height in the adjacent point of the concave heights which have a height, and/or a concavity are formed into a concavity at least at one side of a film, the circumference of this concavity becomes unable to rise, and the polyester film for a lamination whose melting point is 246-270 degrees C can attain the above-mentioned technical problem.

[0009]

[Embodiment of the Invention] The polyester which constitutes the polyester film of this invention is the generic name of the giant molecule which makes main association in a principal chain an ester bond, and it can obtain by usually carrying out the polycondensation reaction of a dicarboxylic acid component and the glycol component. As a dicarboxylic acid component, hydroxy acid, such as alicycle group dicarboxylic acid, such as aliphatic series dicarboxylic acid, such as aromatic series dicarboxylic acid, such as a terephthalic acid, naphthalene dicarboxylic acid, isophthalic acid, diphenyl dicarboxylic acid, diphenylsulfone dicarboxylic acid, difenoxycarboxylic acid, 5-sodium sulfone dicarboxylic acid, and a phthalic acid, oxalic acid, a succinic acid, an adipic acid, a sebacic acid, dimer acid, a maleic acid, and a fumaric acid, and cyclohexane dicarboxylic acid, and parahydroxybenzoic acid, etc. can be mentioned here, for example. Moreover, as a glycol component, aromatic series glycols, such as alicycle group glycols, such as polyoxy alkylene glycol, such as aliphatic series glycols, such as ethylene glycol, a propanediol, butanediol, pentanediol, hexandiol, and neopentyl glycol, a diethylene glycol, a polyethylene glycol, and a polypropylene glycol, and cyclohexane dimethanol, bisphenol A, and Bisphenol S, etc. are mentioned, for example.

[0010] In this invention, it is required for the melting point of the viewpoint of a taste property, thermal resistance, and shelf life to polyester to be 246-270 degrees C. If it may be inferior to thermal resistance and the property may deteriorate by prolonged preservation, when the melting point is less than 246 degrees C, and the melting point exceeds 270 degrees C, the lamination temperature at the time of carrying out the heat lamination of the polyester film at a base material will become high too much. The melting point is still more desirable from the point of lamination nature and shelf life in it being 250-265 degrees C. Although especially the approach of making the melting point of polyester this within the limits is not limited, it is desirable that more than 95 mol % of the polyester which constitutes the polyester film of this invention is an ethylene terephthalate unit and/or ethylene 2, and 6-naphthalene dicarboxy rate.

[0011] Moreover, in the range which does not spoil a taste property, other dicarboxylic acid components and glycol components may be copolymerized, and an above-mentioned thing etc. is used as a dicarboxylic acid component and a glycol component. In addition, these dicarboxylic acid components and a glycol component may use two or more sorts together. In respect of a taste property, diphenyl dicarboxylic acid and 5-sodium sulfone dicarboxylic acid are desirable. Furthermore, unless the effectiveness of this invention is checked, what copolymerized multifunctional compounds, such as trimellitic acid, trimesic acid, and trimethylol propane, may be used for polyester.

[0012] The polyester film of this invention requires that it should come to form into a concavity two or more concave heights which have a height in the adjacent point of the concave heights which have a height, and/or a concavity at least at one side of a film, and the circumference of this concavity should rise from a viewpoint of lamination nature, \*\*\*\*\*-proof at the time of shaping, as a result a taste

property. If it is inferior to \*\*\*\*\*-proof, \*\*\*\* occurs at the time of a lamination and shaping and it is used for the inside of a container when it does not have this concavity, a touch area with contents may become large, the elution to the contents of a low-molecular-weight object may increase, and a taste property will get worse. Moreover, if it uses for container external surface, it will be inferior to design nature and beautiful nature. Here, with the concave heights which have a height in a concavity, a concavity is formed at a film plane and one piece or two or more heights are formed into the concavity. Moreover, the circumference of the concavity is rising.

[0013] These concave heights are explained based on a drawing. Drawing and drawing 2 which showed typically the flat surface of concave heights where drawing 1 was formed on the film plane are drawing 1. It is drawing having shown typically the A-A' cross section, i.e., the cross section of concave heights. They are the concave heights in which a biaxially oriented film and 2 were formed in for 1, and a height and 4 were formed for a concavity and 3 from the concavity 2 and the height 3 in drawing. Although the configuration of the concavity 2 in these concave heights 4 showed what carried out the shape of prolate ellipsoid to drawing 1, especially the form may not be limited and what kind of configuration is sufficient as it. The circumference of a concavity 2 is rising, as shown in drawing 2. Five are climax of a concavity periphery among drawing 2. The number of heights 3 may be one and may be plurality. Moreover, the location of a height 3 may be located in which location in a concavity 2.

[0014] One piece or two or more heights are formed in the adjacent point by which two or more concavities adjoin the concave heights which have a height in the adjacent point of the concavity of this invention.

[0015] These concave heights are explained based on a drawing. For drawing 3 R> 3, drawing and drawing 4 which showed typically the flat surface formed on the film plane are drawing 3. It is drawing having shown the A-A' cross section typically. In drawing, signs 1-4 are Fig. 1 and consent. A height 3 is formed in the location where the concave heights 4 are assumed to have illustrated with the adjacent point of the concavity 2 of the shape of two ellipse. In addition, as for a concavity 2, three or more plurality may adjoin. The circumference of a concavity 2 is rising, as shown in drawing 4. Five are climax of a concavity periphery among drawing 4. Moreover, drawing 5 is the microphotography (however, surface photograph of an example 1 (one 5000 times the scale factor of this)) of the concave heights actually formed in the film front face.

[0016] In this invention, since \*\*\*\*\*-proof improves further that the rate of a surface integral of the above-mentioned concavity is  $1 \times 10^{-3}$  to  $5 \times 10^{-1}$ , it is desirable. If the rate of a surface integral is less than the above-mentioned range, Siwa will become easy to enter at the time of a lamination. Moreover, when it exceeds the above-mentioned range, a taste property may get worse. From viewpoints, such as a taste property and a moldability, the rate of a surface integral of the above-mentioned concavity is more desirable in it being  $1 \times 10^{-2}$  to  $3 \times 10^{-1}$ .

[0017] The manufacture approach of the biaxial-stretching polyester film of this invention can be manufactured by passing through a concavity formation process on the film in the below-mentioned film production which consists of melting, shaping, biaxial stretching, and heat setting. And as a concavity forming cycle in this approach, the method of adding the load of 10 or more kg/cm to a film plane perpendicular direction is useful in the first extension process. However, this invention is not limited to this approach.

[0018] As for the polyester film of this invention, it is desirable that the viewpoint of a moldability to the breaking strength of the longitudinal direction of the film in 150 degrees C and the cross direction is 120 or more MPas. In case it is shaping as the breaking strength in 150 degrees C is less than 120 MPas, a crack may go into a film and corrosion resistance may fall. From a viewpoint of a moldability, it is still more desirable in their being 170 or more MPas. Especially as an approach of making this range whenever [ 150-degree C breaking extension ], although not limited, the approaches of arbitration, such as the approach of attaining by controlling the extension temperature at the time of film production, a scale factor, and heat setting temperature, for example and a method of making the film after film production age, can be taken.

[0019] It can face manufacturing the polyester of this invention, a well-known reaction catalyst and a

coloring inhibitor can be used conventionally, and an alkali metal compound, an alkaline earth metal compound, a zinc compound, a lead compound, a manganese compound, a cobalt compound, an aluminium compound, an antimony compound, a titanium compound, etc. can use phosphorus compounds etc. as a coloring inhibitor as a reaction catalyst, for example.

[0020] Especially the thing for which the compound containing a germanium element is used as a reaction catalyst from a viewpoint of a taste property also in these is desirable. As metallic compounds containing a germanium element, phosphoric-acid content germanium compounds, such as germanium alkoxide compounds, such as diacid-ized germanium, a hydroxylation germanium hydrate or a germanium tetra-methoxide, and germanium ethylene glycoxyde, a germanium phenoxide compound, phosphoric-acid germanium, and phosphorous acid germanium, acetic-acid germanium, etc. are mentioned, for example. In respect of a taste property, the compound containing a germanium element is much more more desirable still in it being amorphous substantially. Here, an amorphous germanium compound does not have a crystalline diffraction peak in an X-ray diffraction method.

[0021] Moreover, the amount of residual germanium elements in a film is still more desirable in respect of a taste property in it being 2-50 ppm. Furthermore, it is more desirable when there are 10-45 ppm of contents of a germanium element. If the effectiveness which used the compound which contained the germanium element as a polymerization catalyst when the amount of residual germanium elements was set to less than 2 ppm may not be discovered and the amount of residual germanium elements exceeds 50 ppm conversely, the amount of catalysts may become superfluous and may be inferior to a taste property. Especially the approach of making the amount of germanium elements this range is not limited.

[0022] Moreover, although phosphorus compounds etc. can be used as a coloring inhibitor, it is not limited to especially this.

[0023] the approach of adding germanium compound fine particles as it is as an approach of adding a metallic-compounds catalyst, if a germanium compound is made into an example, for example -- or the approach of making dissolve a germanium compound into the glycol component which is the start raw material of polyester, and adding can be used as indicated by JP,54-22234,B.

[0024] The polyester of this invention is manufactured as mentioned above. Although a concrete example explains here, this invention is not limited to this. For example, when facing manufacturing polyethylene terephthalate and adding amorphism diacid-ized germanium as a catalyst, in a terephthalic-acid component and an ethylene glycol component, an esterification reaction is carried out, next diacid-ized germanium and phosphorus compounds are added, a polycondensation is carried out until it becomes a fixed diethylene-glycol content under an elevated temperature and reduced pressure succeedingly, and an ester interchange or the method of obtaining a germanium element content polymer is adopted preferably. As a still more desirable approach, the solid-state-polymerization reaction of the obtained polymer is carried out under reduced pressure or an inert gas ambient atmosphere in the temperature below the melting point, the content of an acetaldehyde is decreased, and the method of obtaining predetermined intrinsic viscosity and a carboxy end group etc. is used.

[0025] If it is desirable that the content of the dicarboxylic acid monomethyl ester in a film is 6 ppm or less as for the polyester of this invention, and its content is still more desirable in it being 3 ppm or less and it is not detected from a viewpoint of a taste property, it is much more desirable. When a dicarboxylic acid monomethyl ester content exceeds 6 ppm, it may be eluted in the contents of a can and the taste may be reduced. Here, as dicarboxylic acid monomethyl ester, terephthalic-acid monomethyl ester, isophthalic acid monomethyl ester, naphthalene dicarboxylic acid monomethyl ester, etc. are mentioned, and only one of the two is methyl-ester-ized among carboxyl groups with two dicarboxylic acid. Especially as the technique of making a dicarboxylic acid monomethyl ester content below this value, although not limited, other monomers in the approach of carrying out the direct ester interchange of a dicarboxylic acid component and the glycol component and an after [ a polymerization ] polymer, the approach of extracting to an oligomer component and coincidence, the approach of extracting from the film after film production, etc. are mentioned, for example in the case of the polymerization of polyester.

[0026] The polyester in this invention is desirable when that the amount of diethylene-glycol components is 0.01 - 2.0 % of the weight especially preferably 0.01 to 2.5% of the weight still more preferably 0.01 to 3.5% of the weight maintains preferably the taste property which was excellent even if it received much hysteresis, such as heat treatment at the time of adhesives spreading, desiccation, or processing, and retorting. A still better known antioxidant may be added 0.0001 to 1% of the weight.

[0027] The polyester film of this invention is the point which improves compatibility with the adhesives at the time of laminating in a base material through adhesives, as a result the adhesion to a base material, and it is desirable that the surface tension of at least one side is 45 or more mN/m. Since the adhesion force may be inferior in surface tension being under this value, it is not desirable. Moreover, it is [ after laminating in a base material ] desirable that the surface tension of the viewpoint of the printing nature in the case of being fabricated and used and beautiful nature to both sides is 45 or more mN/m. Since adhesion improves further that surface tension is furthermore 48 or more mN/m, it is still more desirable. Moreover, when the effectiveness at the time of manufacture of polyester film and economical efficiency are taken into consideration, as for surface tension, it is desirable that they are 65 or less mN/m. Although it is not limited especially unless the effectiveness of this invention is checked as an approach of carrying out surface tension to beyond this value, the approach of performing coating can be mentioned to a film front face by the approach of performing corona discharge treatment by the well-known approach, and various well-known spreading compounds and an approach.

[0028] The thickness of the polyester film of this invention is the point of the moldability after laminating in a base material, the covering nature to a base material, shock resistance, and a taste property, and is good to use especially preferably 5-35 micrometers of 3-50 micrometers of things which are 8-30 micrometers preferably still more preferably.

[0029] Especially as the manufacture approach of the polyester film in this invention, although not limited, after drying polyester if needed, it supplies and fuses to a well-known melting extruder, and extrudes the shape of a sheet, and in the shape of a tube from a slit-like die, and by the former, it is made to stick to a casting drum with methods, such as an electrostatic seal of approval, cooling solidification is carried out, and a non-extended sheet is obtained, for example. As an approach of producing a film using this non-extended sheet, although there are a tubular method, a tenter method, etc., after extending to a longitudinal direction, it extends crosswise, or after extending crosswise, the coincidence biaxial-stretching method which is extended to a longitudinal direction and which extends mostly a biaxial-stretching method, a longitudinal direction, and the cross direction to coincidence serially is desirable [ what is depended on a tenter method in respect of the quality of a film is desirable, and ].

[0030] In this extension method, they are 1.7 to 4.0 times still more preferably 1.6 to 4.2 times preferably in each direction as draw magnification adopted. Moreover, as for an extension rate, it is desirable that it is [ 1000 - 200000% ] a part for /, and although extension temperature can be made into the temperature of arbitration if it is +100 degrees C or less of glass transition points more than the glass transition point of polyester, it is preferably good to make [ 80-170-degree C ] 90-150 degrees C and horizontal extension temperature into 80-150 degrees C for vertical extension temperature preferably especially.

[0031] Although a film is furthermore heat-treated after biaxial stretching, this heat treatment can be performed by the approaches of conventionally well-known arbitration, such as a heated roll top, among oven. Although heat treatment temperature can be made into the temperature of the arbitration below the melting point of 120-degree-C or more polyester, it is -5 degrees C or less in 150 - melting point preferably. Moreover, although heat treatment time amount is arbitrary, it is desirable to usually carry out for 1 - 60 seconds. Heat treatment may be performed by loosening a film crosswise [ the / longitudinal direction and/or crosswise ]. Furthermore, re-extension may be performed once or more to each direction.

[0032] Moreover, in order to raise the handling nature of the film of this invention, and workability, it is desirable to make the particle selected by arbitration from external particles, such as a well-known internal particle with a mean particle diameter of 0.01-10 micrometers, an inorganic particle, and an organic particle, contain 0.01 to 50% of the weight. It is especially desirable to contain an internal



particle with a mean particle diameter of 0.1-5 micrometers, an inorganic particle, and/or an organic particle 0.01 to 3% of the weight as a film used for a can inside. Although a well-known technique is employable as the deposit approach of an internal particle, the technique of a publication is employable as JP,48-61556,A, JP,51-12860,A, JP,53-41355,A, JP,54-90397,A, etc., for example. Furthermore, other particles, such as JP,55-20496,A and JP,59-204617,A, can also be used together. In addition, since the defect of a film may arise when the particle which has the mean particle diameter exceeding 10 micrometers is used, cautions are required.

[0033] As this inorganic particle, wet and a dry type silica, colloidal silica, silicic-acid aluminum, titanium oxide, a calcium carbonate, calcium phosphate, a barium sulfate, an alumina, a mica, a kaolin, clay, etc. can use the particle which makes a constituent styrene, silicone, acrylic acids, a methacrylic acid, polyester, a divinylbenzene, etc. as an organic particle, for example. It is desirable to use the particle which makes a constituent inorganic particles, such as wet and a dry type colloid silica, and an alumina, and styrene, silicone, an acrylic acid, a methacrylic acid, polyester, a divinylbenzene, etc. especially. A section particle, an inorganic particle, and an organic particle may use two or more sorts together among these.

[0034] Although not limited especially as a base material for a lamination of this invention, as a metal material, a metal plate made from iron, aluminum, etc. in respect of shaping is desirable. Furthermore, in the case of a metal plate made from iron, the chemical conversion coat layer represented with the inorganic oxide coat layer which improves an adhesive property and corrosion resistance, for example, chromate treatment, phosphating, a chromic acid/phosphating, electrolysis chromate treatment, chromate treatment, chromium chromate treatment, etc. may be prepared in the front face. It is 6.5 - 150 mg/m<sup>2</sup> as chromium especially at a chromium metal reduced property. A chromium hydration oxide is desirable and a plasticity metal deposit, for example, nickel, tin, zinc, aluminum, gun metal, brass, etc. may be prepared further. In the case of tinning, in the case of 0.5 - 15 mg/m<sup>2</sup>, nickel, or aluminum, it is 1.8 - 20 g/m<sup>2</sup>. What has the amount of plating is desirable. On the other hand, although not limited especially as a nonmetal material, paper, a nonwoven fabric, glass, and a macromolecule material are desirable in respect of the lightweight nature in a final product.

[0035] Since the polyester film for a lamination of this invention has the property excellent in lamination nature good as the inside of the bottom of the application by which fabrication is carried out, especially a three-piece metal can, a drum, the object for covering of a free wheel plate, a paper carton, a plastic envelope, etc., etc., and an object for outside covering, and \*\*\*\*\*-proof at the time of shaping after a lamination after laminating it with a base material, it can be preferably used for these applications.

[0036]

[Example] Hereafter, an example explains this invention to a detail. In addition, the property carried out measurement evaluation by the following approaches.

[0037] (1) Observe a concavity and a height film front face with a microphotography.

[0038] (2) Area of the rate field of view of a surface integral of a concavity is set to S, and each area and number of concavities are called for as D<sub>i</sub>, n<sub>i</sub>, then [sigmainiD<sub>i</sub>/S].

[0039] (3) The melting point of polyester film (T<sub>m</sub>)

With the differential scanning calorimeter (Perkin-Elmer DSC2 mold), film about 10mg was measured with 20-degree-C programming rate for /, and peak temperature of fusion was made into the melting point (T<sub>m</sub>).

[0040] (4) Shave off the 0.5g of the amount films of dicarboxylic acid monomethyl ester, and dissolve this in hexafluoro isopropanol. The filtrate which added and filtered the methanol to this was covered over the liquid chromatograph, and the quantum of the amount of dicarboxylic acid monomethyl ester in a film was carried out.

[0041] (5) It installed so that it might become the chuck of the breaking strength tension tester (tensilon) in 150 degree C with 100mm of sample length about a film with a width of face of 10mm, and it held for 90 seconds within the chamber of 150-degree-C ambient atmosphere. Then, the stress (breaking strength) applied at the time of fracture was measured about the longitudinal direction of a film, and the



cross direction as a part for crosshead speed 300mm/.

[0042] (6) Surface tension ( $\gamma$ )

Measurement of surface tension ( $\gamma$ ) is JIS. It carried out according to K-6768. The standard solution used the three following kinds according to the magnitude of surface tension.

30 mN/m  $\leq \gamma < 56$  mN/m: JIS The K-6768 standard solution.

56 mN/m  $\leq \gamma < 72$  mN/m: Aqueous ammonia.

72 mN/m  $\leq \gamma$ : Sodium-hydroxide water solution.

[0043] (7) The resin solution which made the organic solvent dissolve a bisphenol system epoxy resin and a trimellitic anhydride system curing agent in lamination nature film one side at 95/5 of a rate was applied by homogeneity thickness (about 2 micrometers). And it was made to dry for 20 seconds at 120 degrees C so that hardening of adhesives may not advance. It pasted up by sticking this adhesives spreading film to a polyethylene terephthalate nonwoven fabric by pressure at 180 degrees C, and heating it for 1 minute above 200 degrees C after that. The lamination condition of the film after adhesion was evaluated as follows.

Class A: With no whole surface Siwa.

Class B: Siwa was accepted in the film edge.

C class: Siwa was accepted in the whole surface.

[0044] (8) The resin solution which made the organic solvent dissolve a bisphenol system epoxy resin and a trimellitic anhydride system curing agent in \*\*\*\*\*-proof film one side at 95/5 of a rate was applied by homogeneity thickness (about 2 micrometers). And it was made to dry for 20 seconds at 120 degrees C so that hardening of adhesives may not advance. The adhesives spreading side side was stuck to the metal plate which heated this adhesives spreading film beforehand at 182 degrees C by pressure, and it pasted up by heating for 1 minute above 200 degrees C after that. This lamination metal plate was fabricated with the draw-forming machine (contraction ratio (the maximum thickness / the minimum thickness) = it fabricates in 1.5 and the 70-120-degree C temperature field which can be fabricated). Adhesive tape was stuck and exfoliated on the container side face after shaping, and extent of the adhesion condition to the adhesive tape of film \*\*\*\*\* was evaluated as follows.

Class A: There is no powder breakaway.

Class B: Some powder breakaway is accepted locally.

C class: Powder breakaway is accepted in the whole surface.

[0045] (9) After performing pressurization steam treatment for [ 120 degrees-C ] 20 minutes for the metal vessel obtained by the taste property above (8), purified water was left for 15 weeks at 35 degrees C after restoration sealing, it opened after that, and the organoleptic test estimated change (this was made into the taste property) of an odor.

Class A: Change is not looked at at all by the odor.

Class B: Change is hardly looked at by the odor.

C class: Change is greatly looked at by the odor.

[0046] In examples 1-4 and the one to example of comparison 2 example 1, amorphous diacid-ized germanium ( $\text{GeO}_2$ ) was used as a polymerization catalyst, and polyethylene terephthalate (henceforth PET) was obtained from a terephthalic acid and ethylene glycol by the direct ester exchange reaction. After carrying out the vacuum drying of this PET at 180 degrees C for 4 hours, the extruder was supplied and the melting extrusion cast film was obtained from the mouthpiece to cooling drum lifting. Then, it heat-treated by having carried out biaxial stretching of the cast film to vertical extension (extension temperature of 108 degrees C, 3.3 times as many draw magnification as this), and horizontal extension (extension temperature of 120 degrees C, 3.0 times as many draw magnification as this) serially (temperature of 190 degrees C, time amount 7 seconds), and the biaxially oriented film was obtained. Under the present circumstances, the film with a thickness of 15 micrometers which has the concave heights which have a height in a concavity on a front face by performing corona discharge treatment after a vertical extension process, and performing the pressurization process of load 16 kg/cm at a vertical extension process, and performing the draw of a lengthwise direction at 1.05 times at the continuing horizontal extension process was produced. Thus, the surface photograph of the obtained

biaxially oriented film is shown in drawing 5 (one 5000 times the scale factor of this). When this film was evaluated, the property which was excellent as shown in Table 1 was shown.

[0047] In the example 2, the same PET as an example 1 was used, and the film which has the physical properties shown in the table by changing film production conditions was obtained. When this biaxially oriented film was evaluated, the property which was excellent as shown in Table 1 was shown.

[0048] In the example 3, the antimony trioxide (Sb 2O3) was used as a polymerization catalyst, by the ester exchange reaction of dimethyl terephthalate and ethylene glycol, the polymerization of the PET was carried out and it was obtained. Using this PET, except an example 1 and extension conditions, melting extrusion and biaxial stretching were performed similarly and the film as shown in the table was obtained. When this film was evaluated, it was the property which was excellent as shown in Table 1.

[0049] In the example 4, the polymerization catalyst of an example 3 was changed into GeO2, and PET was obtained by the ester exchange reaction. Then, although film production conditions were changed, biaxial stretching was serially performed like the example 1, and the biaxially oriented film which has the concave heights which have a height in a concavity on a front face was obtained. When this film was evaluated, the property which was excellent as shown in Table 1 was shown.

[0050] In the example 1 of a comparison, the polymerization of the 88 mol % and 12 mol [ of isophthalic acid ] % of terephthalic acids was carried out by the ester exchange reaction by having made ethylene glycol and Sb 2O3 into the polymerization catalyst, and isophthalic acid 12 mol % copolymerization polyethylene terephthalate was obtained. This polymer was supplied to the extruder after the 3-hour vacuum drying at 150 degrees C, extension conditions were changed, and the film was produced like the example 1. In addition, in the example 1 of a comparison, the pressurization process in a vertical extension process was not performed, and the concave heights which have a height in a concavity were not formed in the result table side. When this film was evaluated, the property was inferior as shown in Table 1.

[0051] In the example 2 of a comparison, PET used in the example 1 was used, like the example 1 of a comparison, the pressurization process in a vertical extension process was not performed, and the concave heights which require a height into a concavity were not formed in the result table side. The biaxially oriented film as shown in Table 1 was obtained. When this film was evaluated, it was inferior to each property. In addition, the cable address of front Naka is as follows.

PET: Polyethylene-terephthalate PET / I\*: Isophthalic acid copolymerization polyethylene terephthalate (\* is a rate of copolymerization)

GeO2: Diacid-ized germanium Sb 2O3: The dicarboxylic acid monomethyl ester content in an antimony-trioxide MMT:film [0052]

[Table 1]

【表 1】

番号	ポリマー		フィルム					特性		
	ポリエステル	重合触媒	融点 (°C)	表面張力 (mN/m)	MMT (ppm)	陥没部の 面積分率	150°C破断強度 (MPa) MD/TD	ラミネート性	耐腐蝕性	味特性
実施例 1	PET	GeO <sub>2</sub>	252	4.8	0	$2.5 \times 10^{-1}$	193/155	A	A	A
実施例 2	PET	GeO <sub>2</sub>	252	4.4	0	$2.7 \times 10^{-1}$	166/147	B	A	A
実施例 3	PET	Sb <sub>2</sub> O <sub>3</sub>	254	6.0	9.7	$1.5 \times 10^{-1}$	173/154	A	A	B
実施例 4	PET	GeO <sub>2</sub>	253	4.6	7.4	$6.2 \times 10^{-1}$	144/137	B	A	B
比較例 1	PET/1''	Sb <sub>2</sub> O <sub>3</sub>	226	4.2	0	0	189/161	C	C	C
比較例 2	PET	GeO <sub>2</sub>	252	4.4	0	0	147/136	B	C	C

[0053]

[Effect of the Invention] As explained above, even if it performs fabrication after a metal plate and a lamination according to the polyester film for a lamination of this invention, adhesion with a metal plate is good, and the fabrication to containers, such as a metal can, is easy, is further excellent in a lamination and \*\*\*\*\*-proof at the time of fabrication, and can use it suitable for containers, such as a metal can.

[Translation done.]

**\* NOTICES \***

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

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**CLAIMS**

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[Claim(s)]

[Claim 1] Polyester film for a lamination whose melting point two or more concave heights which have a height in the adjacent point of the concave heights which have a height, and/or a concavity are formed into a concavity at least at one side of a film, and the circumference of this concavity comes to rise, and is 246-270 degrees C.

[Claim 2] Polyester film for a lamination according to claim 1 whose rate of a surface integral of this concavity is  $1 \times 10^{-3}$  to  $5 \times 10^{-1}$ .

[Claim 3] Polyester film for a lamination according to claim 1 or 2 whose breaking strength of a 150-degree C film longitudinal direction and the cross direction is 120 or more MPas.

[Claim 4] Polyester film for a lamination according to claim 1 to 3 manufactured using the metallic compounds which contain a germanium element as a polymerization catalyst.

[Claim 5] Polyester film for a lamination according to claim 1 to 4 whose content of the dicarboxylic acid monomethyl ester of isolation in a film is 6 ppm or less.

[Claim 6] Polyester film for a lamination according to claim 1 to 5 which is fabricated by the container and used for it after laminating.

[Claim 7] Polyester film for a lamination according to claim 1 to 6 which was laminated in the metal plate and which is back-used.

[Claim 8] Polyester film for a lamination according to claim 1 to 7 used for 3 piece metal can.

[Claim 9] Polyester film for a lamination according to claim 1 to 6 used after laminating with a nonmetal material.

[Claim 10] Polyester film for a lamination according to claim 9 whose nonmetal material is paper, a nonwoven fabric, glass, or a macromolecule material.

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[Translation done.]